CHAPTER 5

MEDICAL EQUIPMENT MAINTENANCE

Section I. ROLE OF MEDICAL EQUIPMENT MAINTENANCE

5-1. General

a. Combat health support in future military operations may range from the desert to the tropics to the arctic. The uncertainty of the battlefield environment and the method of employment have placed more emphasis on equipment readiness and maintenance of its operational status. Medical equipment technology has advanced at a very rapid pace; equipment items required to support these technological advances have become more complex. In many cases, proper care and maintenance now require sophisticated test, measurement, and diagnostic equipment (TMDE) and continuous and advanced schooling for maintenance personnel.

b. The current maintenance structure consists of unit-level (UL), DS, GS, and depot maintenance. To sustain medical equipment, medical maintenance personnel must be allotted time to perform unscheduled maintenance on medical equipment, perform preventive maintenance checks and services (PMCS), electrical safety inspections, and calibration. Additionally, prescribed load list (PLL) items must be budgeted for and made available at the UL. At DS/GS levels, demand-supported repair parts and consumables and bench stock are required.

5-2. Objectives of the Army Medical Department Maintenance System

a. The overall objective of medical equipment maintenance is to support the readiness and effectiveness of CHS operations by sustaining medical equipment as effectively, responsively, and economically as feasible. Maintenance is defined as the care and effort expended to keep an item in a specified standard condition. Maintenance of an item includes—

(1) *Scheduled services.*

- Preventive maintenance checks and services.
- Electrical safety.
- Calibration.
- Verification.
- Certification.

(2) *Unscheduled services.*

(3) *Technical inspections (TIs).*

b. Medical equipment maintenance ensures that life-sustaining equipment is fully mission capable. Maintenance planning must be conducted concurrently with supply planning as the two areas are closely related. A good maintenance program will relieve strain on the supply system by identifying and repairing equipment that would otherwise require replacement. Proper authorized stockage list (ASL) management improves maintenance turnaround time when repair parts are required beyond PLL stockage authority.

c. Specific objectives of the AMEDD maintenance system are to—

- Provide a more responsive maintenance system, improve operational readiness, and increase mobility and flexibility at the lowest overall cost.
- Establish and effectively use scheduled maintenance programs consisting of PMCS, calibration, verification, and certification (CVC), and electrical safety tests to predict, prevent, and reduce equipment failures.

- Establish and maintain a MEDSTEP in accordance with (IAW) AR 40-61.

- Use the four levels of maintenance (unit, DS, GS, and depot) to minimize resource requirements.

- Establish a vertical maintenance management structure through which maintenance can be performed effectively and economically.

- Establish and maintain a repair parts program IAW AR 40-61.

- Establish procedures where equipment maintenance is supported commensurate with available time and other resources.

- Optimize repairs by replacement forward of the corps rear boundary prior to evacuation.

- Integrate the forward support maintenance concept to maximize equipment in-service time.

5-3. Maintenance Factors

Responsive maintenance comes from the joint effort of many individuals. Their actions are guided and influenced by factors common to all maintenance operations. These factors function like a chain; if one area is neglected, the overall system is weakened. The factors include the following:

a. Command Interest. This is the active involvement of commanders and supervisors at all levels in the medical equipment maintenance operations for which they are responsible. The commander is responsible for the readiness of medical equipment assigned to him whether it is a reportable end item, subassembly, or component of a medical materiel set (MMS). To ensure deployable readiness, commanders set goals, objectives, and priorities. They keep informed of maintenance requirements, status, and capabilities. They provide guidance and direction to unit personnel. Commanders should develop training plans which ensure appropriate personnel receive training and licensing on equipment which requires PMCS.

b. Management. Managers use available resources to accomplish the mission in the most efficient manner. Maintenance management involves all members of the chain of command as well as designated individuals who manage the maintenance resources under their control. The manager plans, organizes, directs, coordinates, and controls resources to accomplish the maintenance mission.

c. Supervision. Maintenance supervisors ensure that personnel perform required tasks in a correct, safe, and timely manner. Supervisors also take an active interest in the training and welfare of their personnel. Supervisors should set goals to maximize the training and licensing of section personnel on assigned equipment which requires PMCS.

d. Motivation. This is the willing desire to perform in order to accomplish the mission. Personnel are motivated by the leadership of unit commanders, supervisors, and maintenance managers.

e. Skill. This is the technical ability of personnel to perform the tasks required by their duty position. Skill development is important to all personnel but particularly to inexperienced soldiers joining the unit. Commanders and supervisors must provide ongoing training and licensing programs to ensure that learned skills are sustained over time.

f. Resources. These include personnel, publications, repair parts, tools, TMDE, facilities, training, and time. Commanders and supervisors at all levels must ensure that their subordinates are adequately resourced to accomplish the mission they are assigned. Mission failure due to lack of required resources is a command failure.

Section II. LEVELS OF MEDICAL EQUIPMENT MAINTENANCE AND RESPONSIBILITIES OF EACH LEVEL

5-4. General

Maintenance supports readiness and effectiveness of Army elements by sustaining systems and equipment as effectively, responsively, economically, and as far forward as the situation permits. The four levels of the Army maintenance system keep materiel in a mission-ready condition, restore equipment to a serviceable condition, or provide approved equipment modifications.

5-5. Levels

Medical equipment maintenance support must be provided as far forward as possible. The four levels of maintenance for medical equipment are—

a. Unit. Unit-level maintenance is performed by the operator and/or medical equipment repairers to attain a high level of operational readiness. This level of maintenance consists of PMCS to detect equipment deficiencies. Maximum use is made of built-in test equipment (BITE) and TDME to perform maintenance. Operator manuals and local standing operating procedures (SOPS) are used as guides. All operators and assistants should be licensed on equipment which requires PMCS.

b. Direct Support. This level of maintenance is that maintenance beyond the authority, capability, and capacity of UL maintenance. Direct support maintenance includes repairing and returning equipment to the user and providing repair parts support. Direct support maintenance is provided by the designated MEDLOG battalion on an area support basis.

c. General Support. This level of maintenance provides authorized maintenance functions that exceed the authority, capability, and capacity of DS maintenance. General support maintenance is provided by the designated MEDLOG battalion on an area support basis.

d. Depot. This level of maintenance supports the maintenance system by overhaul and rebuild operations to include special inspections, tests, and modification program actions. Depot-level maintenance is provided by the USAMMA maintenance divisions or by designated MEDLOG battalions when directed by the appropriate commander. In a mature TO, selected depot-level maintenance capabilities, such as the rebuilding of x-ray tubes, may be authorized at the GS level.

5-6. Responsibilities

a. Unit-Level Maintenance.

(1) *Operator maintenance.* Maintenance tasks which the operator performs consist of—

- Preventive maintenance checks and services IAW the appropriate TMs or commercial manuals. These services include routine services such as cleaning, dusting, washing, checking for frayed cables, stowing items not in use, and checking for loose hardware.

- Replacement of operator accessories and operator repair parts.

NOTE

Replacement of operator parts does not require extensive disassembly of the end item or accessory, critical adjustment after replacement, or the extensive use of tools.

(2) *Medical equipment repairer maintenance.* Medical equipment repairers perform unit maintenance services and functions including—

- Scheduling and performing periodic maintenance services IAW the appropriate TMs or commercial manuals, scheduled periodic maintenance as directed in AR 40-61, electrical safety inspections and tests, and CVC services.

- Performing unscheduled maintenance functions with emphasis on replacement of printed circuit boards (PCBs) and modules, when available. Maintenance allocation charts are used to determine specific actions at each level of maintenance support.

- Operating a repair parts program to include Class VIII and Class IX repair parts, as well as other commodity class parts, for medical equipment.

- Maintaining a technical library of service TMs and all authorized parts listings for on-hand equipment items.

- Conducting TIs on new or transferred items of medical equipment.

- Establishing adequate administrative procedures for the control and documentation of maintenance services and functions IAW Technical Bulletin (TB) 38-750-2.

- Notifying support maintenance activities of requirements and/or evacuating unserviceable equipment or higher echelon PCB and modules.

b. Direct Support-Level Maintenance. Responsibilities of this type of maintenance include the following:

- Providing all authorized maintenance functions which exceed the authority, capability, or capacity of unit maintenance.

- Providing UL maintenance (by the MEDLOG battalion [forward] or medical detachment) to medical units within the CZ without an organic unit maintenance capability.

- Repairing DS equipment.

- Providing on-site support to CZ medical units by means of MSTs.

- Providing repair parts and modules through the exchange program.

- Fabricating minor repair parts as required to meet operational readiness requirements.

- Notifying the next higher level of maintenance support of requirements for on-site MSTs and/or evacuation of unserviceable equipment or higher echelon PCB and modules.

c. General Support-Level Maintenance. Responsibilities of this type of maintenance include the following:

- Providing all authorized maintenance functions which exceed the authority, capability, or capacity of preceding levels of medical maintenance.
- Providing UL maintenance (by the MEDLOG battalion [rear]) to medical units within the COMMZ without an organic unit maintenance capability.
- Repairing GS equipment.
- Providing on-site support to COMMZ medical units and to DS units by means of MSTs.
- Operating a cannibalization point.
- Fabricating repair parts when required.
- Notifying the next higher echelon of maintenance support requirements for on-site MSTs and/or evacuation of unserviceable equipment or higher echelon components modules.
- Providing maintenance support to the NICP medical supply system.

d. Depot-Level Maintenance. This level of medical maintenance includes the following:

- Providing overhaul/rebuild of end items, PCB, x-ray tube heads, and modules in support of the NICP supply system and as "repair and return" actions.
- Performing special inspections, tests, and modification program actions.
- Performing maintenance services and functions for the strategic supply system.
- Manufacturing items and parts when the requirement exists.
- Providing end items, PCB, modules, and repair parts through established programs in support of TOE units.
- Providing on-site MSTs.

Section III. MEDICAL EQUIPMENT MAINTENANCE SUPPORT

5-7. General

a. Unit Commander's Responsibility. Medical maintenance is the responsibility of the unit commander. The scope of medical maintenance ranges from the maintenance functions for basic mechanical equipment to complicated medical electronic equipment such as x-ray machines. If an item of medical equipment in the BAS requires unit maintenance, it is transportedeee to the supporting medical company for maintenance. Medical maintenance support is provided by the medical equipment repairer (UL) assigned to each medical company. If an item of equipment cannot be repaired at the UL, then the unit must notify the DMSO who will transport the equipment to the supporting corps MEDLOG battalion (forward) or request a MST from the supporting MEDLOG battalion (forward). Equipment requiring service beyond the capability of the MEDLOG battalion (forward) will be evacuated to the MEDLOG battalion (rear).

b. Low-Density Lifesaving Diagnostic and Therapeutic Equipment. This equipment will be repaired or replaced immediately. The MEDLOG battalions maintain equipment in the MEDSTEP program. The equipment is used to provide supported activities with serviceable items for unserviceable, economically repairable items. Repairable exchange (RX) of low-density lifesaving equipment through the use of the MEDSTEP may be employed, if necessary. Repairable exchange assemblies, modules, and/or PCBs will also be used to maintain high operational availability rates.

5-8. Combat Unit Organic Medical Care

First aid characterized by self-aid, buddy aid, and the combat lifesaver entails no medical equipment requiring significant maintenance.

5-9. The Combat Medic

Emergency medical treatment is provided by the combat medic with his prescribed load of medical equipment and supplies. No medical maintenance-significant equipment is issued to him.

5-10. The Treatment Squad

This squad establishes the BAS and is composed of treatment teams which are authorized trauma and sick call MESs. Multiple maintenance-significant items are contained in these sets. The equipment is primarily battery-operated and simple mechanical devices. User/operator personnel are capable of performing most repairs using standard operator-level repair parts. The treatment squad can also effect "repairs by replacement" or request "repair and return" services from the supporting medical company. Maintenance services by medical equipment repairers will not normally be possible while the treatment squad is deployed. However, during "stand-down" periods, unit maintenance support can be provided by the medical maintenance repairers from the FSMC or the MSMC. Normally, no item of equipment contained in these sets require DS or GS maintenance. User/operator maintenance tasks and operator-level repair parts will be identified in the TMs or operator manuals and applicable materiel fielding plans (MFPs).

5-11. The Ambulance Squad

This squad, in both the BASs and the medical companies, is composed of medical specialists, ambulances, and a MES per ambulance. Several maintenance-significant items are contained in this MES. The equipment is basic electromechanical items. User/operator personnel are trained to repair most malfunctions using standard operator-level repair parts. The ambulance squads can also effect "repairs by replacement" or request "repair and return" services from their source of medical supply support. There are limited medical maintenance services provided by the medical maintenance repairers from the FSMC or the MSMC. Medical maintenance services are coordinated to ensure maximum medical maintenance support throughout the division.

5-12. The Medical Company

a. The medical company is modular in structure. Multiple modules to include treatment squads, area support squads, patient-holding squads, and ambulance squads are organic to the FSMC and MSMC. Multiple MESs that contain medical maintenance-significant items are organic to these modules.

b. The treatment platoon and its associated medical equipment requires medical

equipment repairers to be assigned to the MSMC. The medical equipment repairers have adequate TMDE, tools, and repair parts. Their primary tasks are scheduled services and repairs by exchanging PCBs, modules, and components/end items.

c. The low density of like equipment items, such as x-ray systems, precludes total organic support by UL maintenance and necessitates the use of MSTs from the MEDLOG battalion (forward). In addition, the attachment of corps-level surgical squads and FSTs also requires MST support. Maintenance plans prepared for major maintenance-significant items are disseminated as maintenance allocation charts located in the equipment TMs and MFPs. The maintenance allocation charts (MACs) designate the maintenance functions authorized to be performed at each level of maintenance. Also, the MACs identify the tools and equipment necessary to perform the specific function and necessary informative remarks.

5-13. The Division Medical Supply Office

Medical equipment maintenance is an important responsibility of the DMSO. The DMSO is located in the MSMC of the MSB of all divisions and is responsible for providing medical maintenance support to the medical treatment elements within the division. The DMSO exercises its medical maintenance responsibilities by supervising the UL medical equipment maintenance program. Medical equipment repairers are assigned to the DMSO to provide UL medical maintenance support to those divisional units and units attached to the division that have medical maintenance-significant equipment and no organic medical maintenance assets. Medical equipment that requires maintenance beyond the organic capability of the owning unit are recovered/evacuated by the owning unit to the DMSO. Separate medical companies will receive medical equipment maintenance from the ASMB or the nearest medical company capable of supporting them.

a. Readiness of Medical Equipment. The DMSO medical maintenance personnel must develop a program to ensure that the division's medical equipment is operational and ready to go to war. The program includes—

(1) *Scheduled maintenance services.* These services consist of PMCS, safety checks, and CVC. They must be scheduled on a periodic basis and should be placed on unit training schedules. The frequency of each scheduled service should be in compliance with technical or commercial manuals and other publications. In consideration of the performance of these services, the following must be provided:

- Adequate availability of equipment and manpower resources.
- Availability of required TMDE.
- Proper scheduling of periodic services and other taskings.

(2) *Remedial repairs.* Repair work orders must be completed in a timely manner to maintain a high readiness posture and prevent a backlog from occurring. A repairer will either repair the equipment, calibrate it, order parts required to effect repair, request MEDSTEP equipment from the MEDLOG battalion, or evacuate the equipment for repair. Equipment is evacuated to the supporting MEDLOG battalion when necessary repairs exceed the unit's TMDE or repair capability.

(3) *Records.* Records for medical equipment are kept IAW AR 40-61. The DMSO should review these records periodically. Required records for medical equipment are as follows:

(a) DA Form 2404, Equipment Inspection and Maintenance Worksheet.

(b) DA Form 2405, Maintenance Request Register.

(c) DA Form 2407, Maintenance Request and DA Form 2407-1, Maintenance Request—Continuation Sheet.

(d) DA Form 2409, Equipment Maintenance Log (Consolidated).

(e) DA Form 5621-R, General Leakage Current Requirements (LRA).

(f) DA Form 5624-R, DC Defibrillator Inspection Record (LRA).

(g) DA Label 175, Defibrillator Energy Output Certification.

(h) DD Form 314, Preventive Maintenance Schedule and Record.

(i) DD Form 2163, Medical Equipment Verification/Certification.

(j) DD Form 2164, X-ray Verification/Certification Worksheet.

(k) FDA Form 2579, Report of Assembly of a Diagnostic X-ray System.

(4) *Repair parts.* Prescribed load list parts and quick supply store (QSS) items need to be monitored routinely at UL; shop stocks (demand-supported), bench stocks, and QSS items authorized at DS, GS, and depot level also need to be monitored routinely. A mandatory parts list (MPL) of repair parts required to support medical equipment that is nondemand-supported during peacetime operations is published in TM 8-6500-MPL. It should be noted that some repair parts needed to repair medical equipment fall in the category of Class IX repair parts (that is, common fasteners, electrical components, and others). Requisitions for Class IX repair parts are sent through the organization's supporting motor pool and require monitoring and follow-up efforts. Special considerations for medical repair parts are explained in AR 40-61.

b. Division Medical Maintenance Services. Organic medical equipment maintenance will be provided as follows:

(1) *Operator/user maintenance.* Responsibilities of operators/users include—

- Maintaining equipment by performing routine services/operator PMCS. (Some examples of these services are cleaning, dusting, washing, and checking for frayed cables and loose hardware.)
- Coordinating maintenance services beyond their capability with unit maintenance repairers.
- Performing equipment operational testing.
- Replacing operator-level spare and repair parts that will not require—
  - Extensive disassembly of the end item.
  - Critical adjustment after replacement.
  - Extensive use of tools.
- Maintaining operator's literature with the equipment.
- Maintaining and using TM 8-6500-001-10-PMCS, for all reportable medical equipment.

(2) *Unit-level maintenance.* Responsibilities of division medical equipment repairers include—

- Scheduling and performing services IAW the appropriate technical or operator manuals. (Services include electrical safety inspections and tests and CVC.)
- Performing unscheduled maintenance functions with emphasis upon the replacement of assemblies, modules, and PCBs.
- Operating a medical equipment repair parts program to include Classes VIII and IX as well as other commodity class parts.
- Maintaining a technical library of operator and maintenance TMs and/for associated manufacturers' manuals and parts lists for all maintenance-significant medical equipment in the division.
- Conducting TIs of new or transferred medical equipment within the division.
- Maintaining documentation of maintenance functions within the division IAW TB 38-750-2 or DA standard automated systems.
- Collecting and reporting data for readiness reportable medical equipment.
- Determining the level of maintenance required to repair a piece of equipment.
- Notifying the MEDLOG battalion (forward) of requirements for maintenance support services, RX, or MEDSTEP assets.
- Evacuating all medical equipment requiring DS-level maintenance to the MEDLOG battalion (forward).

5-14. The Medical Battalion, Logistics (Forward)

a. This battalion provides DS maintenance for medical equipment within the corps. It also provides UL maintenance support for medical equipment to supplement units not otherwise provided such support. The entire CHS chain from the treatment squads through the corps-level hospitals (which are discussed in Section IV of this chapter) will require varying degrees of medical equipment maintenance support from the maintenance element of the MEDLOG battalion (forward).

b. In corps and forward medical units, diagnosis and repair of medical equipment must be accomplished as far forward as possible. Ideally, equipment will be repaired on-site by either organic medical equipment repairers or by the MST from the MEDLOG battalion (forward). However, some equipment will require evacuation on a "repair and return" basis, or exchange using MEDSTEP assets.

c. Following on-site assistance, the next priority of DS maintenance will be providing exchange, PCBs, and modules forward with subsequent repair and return to stock actions. Equipment requiring a higher level of support will be handled by MSTs from the MEDLOG battalion (rear) or evacuated as appropriate.

d. Controlled exchange, cannibalization, and other maintenance programs will be used as dictated by command policy IAW AR 40-61 and AR 750-1. These programs will prevent nonfunctional equipment from adversely impacting upon the delivery of health care.

5-15. The Medical Battalion, Logistics (Rear)

a. This battalion provides DS and GS maintenance to medical units located within the COMMZ. It also provides backup DS and GS maintenance to the MEDLOG battalion (forward). Most items that exceed the capability of the MEDLOG battalion (rear) may be returned to CONUS.

b. Combat health support, above treatment squad capability, to the COMMZ hospitals will require varying degrees of medical equipment maintenance from the maintenance elements of the MEDLOG battalion (rear). This level of maintenance will usually not be "visible" to division units; the MEDLOG battalion (forward) will serve as their contact for all higher-level maintenance services.

c. The MEDLOG battalion (rear) MSTs will provide support to the MEDLOG battalion (forward) as well as to the medical units located in the COMMZ.

d. Next in maintenance service priority, the MEDLOG battalion (rear) will provide services to COMMZ units and "repair and return" services for MEDLOG battalion (forward) RX returnables. Emphasis will always concentrate on moving serviceable items forward with subsequent return of unserviceable. The significant densities of equipment items forward of the MEDLOG battalion (rear) will allow production line-type services for repairable.

5-16. The Theater Medical Materiel Management Center

This center is responsible for reviewing and analyzing demands and computing requirements for medical equipment maintenance in the theater.

5-17. Depot Support

a. The primary mission of depot-level maintenance support, located in CONUS, is to perform functions for the NICP logistics system to include surveillance and maintenance for equipment in storage. This function includes the rebuild/overhaul of modules, components, and items retrograded from the TO. (Using units will usually have replacement equipment already furnished.)

b. Additional depot missions include modernization, modification, and fabrication of items as required. These missions require unique skills and associated support equipment and are accomplished in CONUS.

c. The depot-level activities will also manage any required contractual arrangements with the original manufacturers or other third party maintenance sources when in-house capabilities or capacities are not available.

Section IV. THEATER HOSPITAL MEDICAL EQUIPMENT MAINTENANCE

5-18. General

This section provides an overview of medical equipment maintenance for the theater hospitals.

5-19. Medical Equipment Maintenance

a. Echelon III Hospitals.

(1) *Mobile army surgical hospital.* Although the MASH is an Echelon III hospital, it is designated to primarily function within the rear area of the division or the forward edge of the corps. This organization is staffed to perform unit maintenance on organic equipment. The MEDLOG battalion (forward) provides repair and return services and MST on-site assistance to include DS maintenance support. Assistance may also be required from the MEDLOG battalion (rear) as well as depot-level assistance from CONUS. Maintenance plans for maintenance-significant items are defined in the maintenance allocation charts located in equipment TMs and MFPs. See TOE 08765L000 for the medical maintenance-related equipment.

(2) *Combat support hospital.* This hospital will normally be employed in the corps area. The MMSs for the CSH contain numerous items of maintenance-significant medical equipment to include multiple high technology items. This organization is staffed to perform unit maintenance on organic equipment. Medical equipment repairers (advanced) organic to the CSH provide UL maintenance services on the high technology items and supervision of maintenance services. Although the primary maintenance functions must continue to concentrate on scheduled services and remedial repairs by replacement of PCBs, modules, and component/end items, the higher densities and nonmodular equipment configurations require an advanced level of component-level repair methodologies. Therefore, limited DS capabilities are organically assigned to the CSH. Nonetheless, "repair and return" services and MST on-site assistance from the MEDLOG battalion (forward) are necessary. Assistance may also be required from the MEDLOG battalion (rear) as well as depot-level assistance from CONUS. Maintenance plans for maintenance-significant items are defined in the maintenance allocation charts located in equipment TMs and MFPs. See TOE 08705L000 for the medical maintenance-related equipment.

b. Echelon IV Hospitals. The FHs and GHs are normally located in the COMMZ. These organizations are staffed to perform UL maintenance on organic equipment. The MMSs for these hospitals contain numerous items of maintenance-significant medical equipment, to include additional high technology items not authorized to corps and divisional units. These hospitals will be required to provide UL maintenance services on high technology items and supervision of maintenance services. Although the primary maintenance functions must continue to concentrate on scheduled and unscheduled services by replacement of PCBs, modules, and components/end items, the higher densities and nonmodular equipment configurations will require an increased component-level repair methodologies. Repair and return services and MST on-site assistance from the MEDLOG battalion (rear) are necessary. See TOE 08715L000 and TOE 08725L000 for the medical maintenance-related equipment.

5-20. Battle Damage Assessment and Repair

a. Battle damage assessment and repair (BDAR) is a program which was developed to enhance the readiness of vehicles and prime movers. It entails the authorized, temporary repair of specific vehicle parts after assessment by the unit maintenance personnel and as authorized by the unit commander IAW with BDAR guidelines.

b. This program is intended for use on vehicles / prime movers only. **MEDICAL EQUIPMENT IS NOT INCLUDED IN THE BDAR PROGRAM.**

c. Although the *BDAR program does not apply to medical equipment*, medical personnel assigned to units with vehicles must be aware of the principles of BDAR. If not explained to them, they may misconstrue the concept and apply it to medical equipment. For further explanation of the BDAR program, see FM 63-20.